PATENT SPECIFICATION
DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Process for the production of Furnace Black

We DEUTSCHE GOLD - UND SILBER-SCHEIDEANSTALT VORMALS ROESSLER, of 9, Weissfrauenstrasse, Frankfurt (Main), Germany, a body corporate organised under the laws of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a process for the production of furnace black and, more especially, to the additional gas which is introduced, together with the starting material and air, into the furnace.

As raw material for the furnace process, natural gas is often replaced by high-boiling hydrocarbons, usually aromatic but possibly also aliphatic, such as residual tars from the catalytic cracking of petroleum distillates, aromatised extracts of the petroleum industry, high-boiling coal-tar oils or gas oil. The oil is sprayed through a specially-designed burner inside a carbon black-producing furnace, an additional combustible gas and only enough air for incomplete combustion of the oil are simultaneously introduced.

The exhaust-gas, which contains carbon black and also such combustible gases as carbon monoxide and hydrogen, may be cooled in separation plants, for example cyclones, tube filters or electrical flocculators with filters, is freed from the carbon black and burnt. The heat from this combustion may possibly be made use of, for example in boiler installations. The precipitated carbon black may be used in granulated form, mainly as an active filler in the rubber industry.

The additional gas is a combustible gas with a high calorific value, which usually consists wholly or in part of gaseous saturated or unsaturated hydrocarbons. Both the oil used as raw material and the additional gas are often introduced into the carbon black furnace under a pressure greater than atmospheric.

Since this gas, like the oil, contains carbon, it is important as an additional raw material for the production of many types of furnace black with special filler properties.

Natural gas is most often used as additional gas but petroleum refinery gases of various types serve the same purpose. Consequently, furnace black installations are preferably erected in natural gas regions or near petroleum refineries. If neither raw material is available, coke-oven gas can be used, but this is not usually economical.

The present invention provides a process using a combustible additional gas which is easily obtained and is neither natural gas, refinery waste gases nor coke-oven gas. It is the exhaust gas, of low calorie content resulting from the process for the production of furnace black, freed from carbon-black, washed, filtered and enriched with liquid hydrocarbons of b.p. 30 to 280° C., more especially of the aliphatic series, such as crude benzine of b.p. 35 to 130° C. The mixture which is obtained is supplied as additional gas to the carbon black furnace.

The present invention provides, therefore, a process for the production of furnace black in which a carbonaceous starting material and a combustible additional gas are burnt in a limited supply of air wherein the exhaust gas from the furnace is freed substantially completely from carbon black, is enriched with liquid hydrocarbons of b.p. 30 to 280° C. and the resulting mixture is supplied to the furnace as the combustible additional gas.

The accompanying drawing is a flow chart of the process.

A suitable oil is sprayed through the

pressure pipe 2 into the carbon black furnace 1. Simultaneously, a controlled quantity of cold or preheated air is introduced, with turbulence, through the pipe 3 so that an accurately controlled incomplete combustion of the oil to form carbon black and waste gas is achieved. The hot gas, carrying carbon black, which leaves the furnace is conveyed through the pipe 4 into the cooling and carbon-separation section 5, in which it is first of all cooled by indirect or direct cooling. Then the carbon black contained in it is almost completely separated out, for example by connected cyclones, tube filters or electrostatic precipitators of known design and is conveyed by way of the pipe 6 to be granulated and stored.

The exhaust gas containing only traces of carbon black passes from section 5, through the pipe 7, to the washing tower 8, in which any liquid and the last traces of carbon black contained in it are removed with water.

This initially-purified residual gas containing carbon monoxide and hydrogen, has a calorific value of for example 800 kcal/per cubic metre which depends on the type of carbon black manufactured. It passes through the pipe 9 to the consumption point 10, for example a steam boiler installation or a heating installation, where the heat may be usefully employed, or to the slow-combustion device 11, where it is burnt without utilisation of the heat.

Some of the residual gas passes through the pipe 12, into the fine-purification device 13, comprising for example, water separators and filter candles, and, from thence through the pipe 14 into the compressor 15, where it is brought to a pressure of several atmospheres.

The gas leaves the compressor through the pipeline 16 and is mixed with crude benzine, supplied through the pipe 17 under presure. The mixture, which is used as the additional gas, is warmed in the heater 18 to the necessary temperature and supplied through the pipe 19 to the furnace 1.

By mixing the residual gas with crude benzine an additional gas of high calorific value is obtained. Its use in the carbon black furnace has been proved extremely satisfactory, for, by controlling the quantities of the benzine and the purified exhaust-gas, the technical rubber properties of the furnace black may be finely adjusted. In general from 20 to 100 kg. of hydrocarbon, most advantageously from 30 to 40 kg., are added for each 100 cubic metres of purified exhaust gas.

EXAMPLE

410 kg. of a high-boiling coal tar oil and 150 cubic metres of compressed air under a pressure of 4 atm. were supplied each hour to the carbon black furnace. 130 cubic metres of purified exhaust gas, at a pressure of 3 atm., enriched with 45 kg. of crude benzine, were supplied each hour as additional gas. When 1200 cubic metres per hour of combustion air at a temperature of 350° C. were simultaneously supplied there were obtained 198 kg. per hour of a furnace black, true to standard, and of the international type ISAF and, calculated as dry gas, 1980 cubic metres per hour of process gas.

Because of the return of the combustible residual gas and the use of crude benzine, which has reasonable calorific value at low price, the process according to the invention provides economic advantages. In addition, as has already been mentioned, it makes the location of a furnace black installation substantially independent of mineral gas, refinery gas or coking plant gas.

WHAT WE CLAIM IS:—

1. A process for the production of furnace black, in which a carbonaceous starting material and a combustible additional gas are burnt in a limited supply of air, wherein the exhaust gas from the furnace is freed substantially completely from carbon black, is enriched with liquid hydrocarbons of b.p. 30 to 280° C., and the resulting mixture is supplied to the furnace as the combustible additional gas.

2. A process for the production of furnace-black as claimed in claim 1 wherein the low-boiling liquid hydrocarbon is aliphatic in nature.

3. A process for the production of furnace-black as claimed in claim 1 or claim 2 wherein the low-boiling liquid hydrocarbon is crude benzine.

4. A process for the production of furnace black as claimed in any of claims 1 to 3 wherein from 20 to 100kg. of hydrocarbon are added for each 100 cubic metres of purified exhaust gas.

5. A process for the production of furnace black as claimed in claim 4 wherein from 30 to 40 kg. of hydrocarbon are added for each 100 cubic metres of purified exhaust gas.

6. A process for the production of furnace black as claimed in any of claims 1 to 5 wherein the purified exhaust gas and the hydrocarbon are compressed and heated before entering the furnace.

7. A process for the production of furnace-black substantially as described with reference to the Example.

8. Furnace black when produced by the process claimed in any of the preceding claims.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*